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Publications at the Intersection of Academia and Market: Unpacking Scholarly Outputs of University-Industry Collaboration in Brazil

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Introduction

University-Industry Collaboration (UIC) offers significant benefits to stakeholders, stimulates market competitiveness, and strengthens the economy. Promoting this collaboration type is a strategy that has captured the attention of policymakers in the field of Science, Technology, and Innovation (STI) worldwide.

The motivations for the agents involved in a partnership between Research Organisations (ROs) and companies are diverse. For the industry, incentives may arise through the reduction of research and development (R&D) costs, access to the latest advances in research knowledge, utilisation of cutting-edge laboratory infrastructure, enhancement of internal skills, and increased competitiveness (Hagedoorn, Link, & Vonortas, 2000; Kroll, 2016). On the other hand, for ROs, motivations include access to industrial production infrastructure, opening venues for technology and knowledge transfer, sharing the risk of projects and opening of new research streams or the deepening of existing ones (Salles-Filho et al., 2021). Moreover, for the economy and society, UIC can unfold benefits such as increased national public and private investment in R&D, exchange and sharing of scientific and technological knowledge among social agents, and the acceleration of innovative and technological solutions that can enhance the quality of life and international competitiveness (Hagedoorn, Link, & Vonortas, 2000).

In the face of the abovementioned benefits, it is necessary to understand the barriers that hinder the realisation of University-Industry Collaboration, especially in the Brazilian context. According to the 2023 Global Innovation Index (WIPO, 2023), Brazil ranks 78th out of 132 countries in the global UIC ranking. Moreover, this is not a recent scenario but a historical difficulty that has persisted in stagnation, as asserted by Faria (2021) using data from the Brazilian Industrial Research of Technological Innovation (PINTEC) until 2017. According to Salles-Filho et al. (2021), the factors obstructing collaboration can be of two natures: asymmetries in strategic orientations and incentives; and transaction barriers regarding intellectual property and structural bureaucracy.

Well-founded public policies have the potential to mitigate existing barriers and provide incentives for collaboration. The Organisation for Economic Co-operation and Development (OECD, 2002) outlines a series of public policies that can be established to encourage UIC: financial incentives for collaborative research, cooperative research centres, public seed capital funds, publicly funded intermediaries, among others. In this sense, our research aims to contribute to the understanding of the UIC landscape in Brazil, a topic that receives little attention in STI research in the country. Through bibliometric indicators, we seek to better understand the barriers to collaboration, particularly for ROs.

Research Design

To investigate the Brazilian University-Industry Collaboration scenario for technological innovation, we will use bibliometric indicators from OpenAlex, covering articles published from 2012 to 2022. This period was selected to ensure adequate maturation of scholarly output indicators, such as citation and readership

counts. The study sample will consist of publications with at least one company and one university among the authors' affiliations, with all involved organisations being Brazilian.

For this set of publications, we will analyse the following indicators: number of authors per publication, number of collaborating institutions, number of funders, number of cited references, and open access availability. Additionally, we will investigate the scientific impact of the publications based on the impact factor of the journals, the number of citations received, citations in patents, and citations in policy documents (figures extracted from Overton). Additional engagement and visibility metrics will be analysed, including readership, views or downloads, and mentions on social media, as recorded by Altmetric.

To contextualise the results, we will compare these indicators with those of a matching control group derived from the sample: publications with Brazilian affiliations in the same thematic areas and period but without industry collaboration.

Preliminary results and expected contributions

We conducted an initial search in OpenAlex using the following criteria: articles published between 2012 and 2022 that include at least one institution classified as a "company" and at least one classified as "education". Furthermore, to avoid bias in the scientific impact indicators, all participating institutions had to be based in Brazil. Other types of publications, such as reviews, book chapters, and dissertations, were excluded to ensure greater consistency in the analysis. As a result, our preliminary sample comprises 3,565 articles, jointly published by 161 companies ("company", in OpenAlex) and 327 universities ("education", in OpenAlex). Other collaborating institutions also appear in the sample, such as "nonprofit", "government", and "healthcare" — all of which are Brazilian.

OpenAlex organises "concepts" into five hierarchical levels, where the lower levels represent broader areas of knowledge, while the higher levels correspond to more specific topics. For example, level 0 may include the concept "Biology", whereas level 3 may include "Plant Pathology". These concepts are assigned to publications based on a score ranging from 0 to 1. The higher the score, the greater the relevance of that concept to the content of the publication. From the preliminary sample, we extracted all level 3 concepts associated with the articles, provided they had a score above 0.7. We then searched the database for all articles linked to the same concepts—also with a score greater than 0.7—which are affiliated exclusively with Brazilian institutions and which, importantly, never contain both an institution of type "education" and an institution of type "company" simultaneously. This process yielded a preliminary comparison group consisting of 69,800 articles that are highly similar to those in the sample (sharing the same highly relevant concepts), but which were not published in University–Industry Collaboration.

By comparing the scientific impact indicators of the sample and the comparison group, we expect to find a lower scientific impact for publications derived from UIC, as these tend to focus more on the internal needs of companies and less on broader scientific questions, as corroborated by the literature (Ankrah & AL-Tabbaa, 2015; Pujotomo et al., 2023; Hong & Su, 2013). On the other hand, we may find a greater altmetric impact for the sample.

Bringing this evidence to the Brazilian context is important for understanding the motivations and barriers, particularly for universities, enabling policymakers to make more informed decisions when designing policies to foster UIC. We also hope to contribute to the understanding of UIC in the Global South, given that Brazil shares similarities with other developing countries in terms of technological innovation in industry.

Limitations and future studies

A potential limitation of the study lies in the inconsistencies observed in OpenAlex, which are more frequent when compared to databases such as WoS and Scopus, given its less stringent editorial curation. Nevertheless, OpenAlex was selected due to being an open and freely accessible database, as well as for its broader coverage of countries from the Global South, including Brazil. Random checks were conducted on the preliminary data, which showed consistency in the

classification of both institution types and concepts. However, we do not rule out the possibility that a change of database may become necessary, should such inconsistencies prove to be significant.

Further studies are needed to deepen the analysis, for instance, by examining patent indicators to assess the technological impact of these collaborations, as well as conducting a comparative study on the scientific impact of UIC in Brazil, contrasting it with other developing countries similar to Brazil and with developed countries, which typically exhibit higher levels of industrial innovation. Similar studies conducted using the WoS and Scopus databases may also offer valuable insights for comparative purposes.

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